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10/562,254	12/20/2005	Raymond J.E. Huetting	GB030096US1	5647
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NXP, B.V. NXP INTELLECTUAL PROPERTY DEPARTMENT M/S41-SJ 1109 MCKAY DRIVE SAN JOSE, CA 95131			KUO, WENSING W	
			ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

Office Action Summary	Application No. 10/562,254	Applicant(s) HUETING, RAYMOND J.E.	
	Examiner W. Wendy Kuo	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 December 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13 and 14 is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☒ Claim(s) 11 and 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-14 are pending.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-3 and 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagawa et al. (US 6,452,231) (hereinafter Nakagawa).

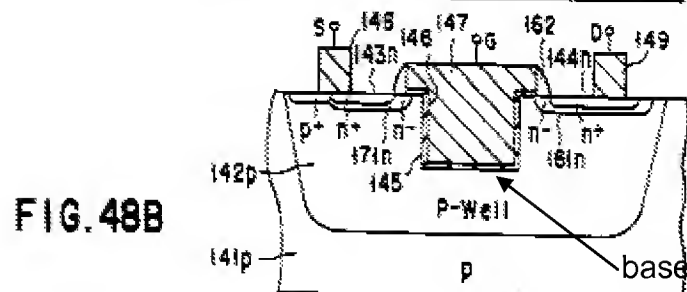
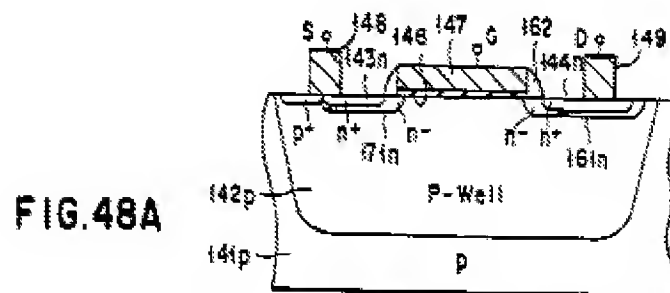
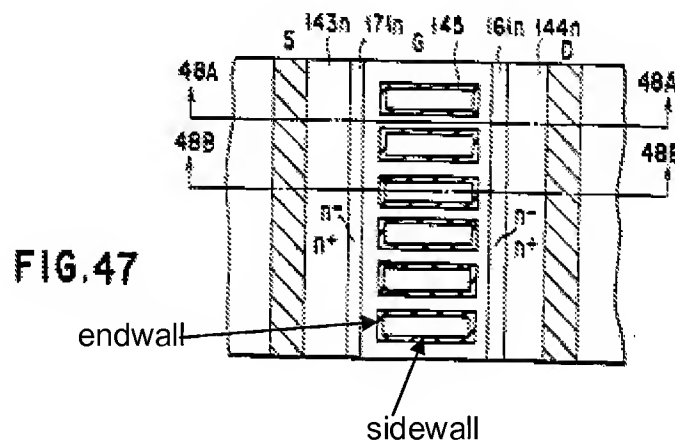
With respect to claim 1, Nakagawa (e.g. Figures 47, 48A, and 48B) teaches a semiconductor device having opposed first and second major surfaces, comprising:

- A body region 142p ***in a substrate*** 141p at the first major surface;
- At least one cell having longitudinally spaced source (143n, 171n) and drain (144n, 161n) implantations extending into the body region 142p from the first major surface, the source and drain implantations being spaced away from the substrate 141p by part of the body region 142p and defining a channel part of the body region between the source and drain implantations;
- At least one insulated gate trench 145 extending longitudinally from the source implantation (143n, 171n) to the drain implantation (144n, 161n) through the body region 142p, the insulated gate trench 145 including a gate conductor 147 insulated from the source and drain implantations and the body region by a gate dielectric 146 along the side and end walls and the base of the trench (see

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annotated Figure below), the source (143n, 171n) and drain (144n, 161n) implantations extending along part of the side walls of the trench,

- Wherein the source and drain implantations include conductive shallow contact regions (143n, 144n) at the first major surface extending vertically into the body 142p



Nakagawa fails to specify the depths of the shallow contact regions and the trench. However, differences in depths will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such depths are critical. Scaling up or down of a prior art process capable of being scaled up or down will not establish patentability in a claim to an old process so scaled. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976).

It is noted that the specification contains no disclosure of either the critical nature of the claimed shallow contact region/trench depths or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Since the applicant has not established the criticality of the shallow contact region/trench depths, and a change in size is generally recognized as being within the level of ordinary skill in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use these values in the device of Nakagawa.

With respect to claim 2, Nakagawa (e.g. Figure 48B) teaches that the body region is of first conductivity type (p-type) and the shallow contact regions are of a second conductivity type (n-type) opposite to the first conductivity type.

With respect to claim 3, Nakagawa teaches that each of the source and drain implantations further comprises a lower doped region (161n, 171n) of lower doping than the shallow contact region.

With respect to claim 5, Nakagawa (e.g. Figure 47) teaches that the semiconductor device comprises a plurality of cells laterally spaced across the first major surface.

With respect to claim 6, Nakagawa (e.g. Figure 47) teaches that gate trenches alternate with the plurality of cells laterally across the first major surface.

With respect to claim 7, Nakagawa (e.g. Figure 47) teaches that each cell has a gate trench laterally within the confines of the cell.

With respect to claim 8, Nakagawa fails to specify the depths of the lower doped region. However, differences in depth will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such a depth is critical. Scaling up or down of a prior art process capable of being scaled up or down will not establish patentability in a claim to an old process so scaled. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976).

It is noted that the specification contains no disclosure of either the critical nature of the claimed lower doped region depth or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Since the applicant has not established the criticality of the lower doped region depth, and a change in size is generally recognized as being within the level of ordinary

skill in the art, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use these values in the device of Nakagawa.

With respect to claim 9, Nakagawa (e.g. Figures 35A and 35B) teaches that the source and drain implantations consist exclusively of the shallow contact region.

With respect to claim 10, Nakagawa (e.g. Figure 48B) teaches that the semiconductor device is on a conductive substrate of first conductivity type.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagawa in view of Hueting et al. (US 6,534,823).

With respect to claim 4, Nakagawa (e.g. Figures 48A and 48B) teaches:

- The source implantation includes a higher doped shallow source contact region 143n and a lower doped source drift region 171n between the higher doped source contact region and the body 142p;
- The drain implantation includes a higher doped shallow drain contact region 114n and a lower doped drain drift region 161n between the higher doped drain contact region and the body 142p

Nakagawa fails to teach that the insulated gate trench includes potential plate regions extending longitudinally on either side of a central region, the potential plate regions being adjacent to the source and drain drift regions respectively, and the central region being adjacent to the body; and the thickness of the gate dielectric sidewalls of the insulated gate trench is greater in the potential plate regions of the insulated gate

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than the central region. However, Hueting (e.g. Figure 1) teaches that an insulated gate trench 80 includes potential plate regions 71 extending longitudinally on either side of a central region 70 (field plate region 71 is depicted as extending either to the right or to the left of gate structure 70), the potential plate regions being adjacent to the source and drain drift regions 50 respectively, and the central region 70 being adjacent to the body 6; and the thickness of the gate dielectric sidewalls of the insulated gate trench 80 is greater in the potential plate regions 71a of the insulated gate than the central region 70a for the benefit of providing a lateral field effect device having a trench gate structure with a low on-resistance and good reverse voltage withstanding characteristics (column 1, lines 42-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the device of Nakagawa with the potential plate regions of Hueting for the benefit of providing a lateral field effect device having a trench gate structure with a low on-resistance and good reverse voltage withstanding characteristics.

Allowable Subject Matter

3. Claims 13 and 14 are allowed.
4. Claims 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

5. Applicant's arguments filed 05 December 2008 have been fully considered but they are not persuasive.

Regarding Applicant's response that "the alleged trench region in the '231 reference does not extend into a source or drain region, or into a source or drain contact region, and correspondingly does not have a gate conductor insulated from the source and drain by a dielectric along sidewalls and endwalls of the dielectric" (remarks at page 5, paragraph 2), initially, it is noted that claim 1 recites in part, "the insulated gate trench including a gate conductor insulated from the source and drain implantations and the body region by a gate dielectric along the side and end walls and the base of the trench, the source and drain implantations extending along part of the side walls of the trench" but does not recite that that source and drain implantations extend into and past the end walls of the gate trench. Therefore, Nakagawa (e.g. Figure 48A) discloses that the source 171n and drain 161n extend along a part of the side walls of the trench because they extend into a portion of the gate 147 that is insulated from the source and drain by a dielectric 146 along side and end walls (see annotated figure above). Note that in response to Applicant's argument that the references fail to show certain features of Applicant's invention, it is noted that the features upon which Applicant relies (i.e., the trench extends into the source and drain regions) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from

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the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding Applicant's response that "the Office action has erroneously alleged that regions 143n and 144n are 'shallow contact regions,' where these regions are the actual source and drain regions themselves," and the "further cited regions 171n and 161n are respectively n-type offset regions" (remarks at page 6, continuing paragraph), it is noted that although claims of issued patents are interpreted in light of the specification, prosecution history, prior art and other claims, this is not the mode of claim interpretation to be applied during examination. During examination, the claims must be interpreted as broadly as their terms reasonably allow. *In re American Academy of Science Tech Center*, 367 F.3d 1359, 1369, 70 USPQ2d 1827, 1834 (Fed. Cir. 2004) (The USPTO uses a different standard for construing claims than that used by district courts; during examination the USPTO must give claims their broadest reasonable interpretation in light of the specification). This means that the words of the claim must be given their plain meaning unless the plain meaning is inconsistent with the specification. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). MPEP §2111.01. See also *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997) (The court held that the PTO is not required, in the course of prosecution, to interpret claims in applications in the same manner as a court would interpret claims in an infringement suit. Rather, the "PTO applies to verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into

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account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in applicant's specification."). MPEP §2111.

Accordingly, Nakagawa (e.g. Figure 48A) teaches that the source 171n and drain 161n implantations include conductive shallow contact regions (143n, 144n).

Regarding Applicant's response that "the Examiner has not presented a *prima facie* case of obviousness because the Examiner has not cited to any reference that teaches source and drain implantations which have conductive shallow contact regions," and thus, the Applicant need not show the criticality of the claimed range (remarks at page 8, paragraph 1), a *prima facie* case of obviousness has been presented in view of Nakagawa as addressed above.

Regarding Applicant's response that "the proposed modification of the '231 reference would appear to render it inoperable for its intended purpose (*i.e.*, by widening the trench into the respective source/drain regions, in contrast to FIG. 48B)" (remarks at page 8, paragraph 2), it is noted that the rejection in view of Nakagawa does not rely on this alleged modification but instead, meets the claim limitations without such a modification (as addressed above).

Regarding Applicant's response that "the cited portions of the '348 reference do not correspond to the claimed invention" because "the respective potential plate regions (and the trench itself) do not extend into the source/drain regions" (remarks at page 8-9), it is noted that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In the instant case, claim 4 recites in

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part, a semiconductor device having “potential plate regions being adjacent to the source and drain drift regions” and not a semiconductor device having potential plate regions extending into the source/drain regions.

Regarding Applicant’s response that “there is no need for such plate regions where the cited trench does not extend as claimed” (remarks at page 9, continuing paragraph), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the device of Nakagawa with the potential plate regions of Hueting for the benefit of providing a lateral field effect device having a trench gate structure with a low on-resistance and good reverse voltage withstanding characteristics.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. Wendy Kuo whose telephone number is (571)270-1859. The examiner can normally be reached Monday through Friday 7:00 AM to 4:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue A. Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

W. Wendy Kuo
Examiner
Art Unit 2826

/Minh-Loan T. Tran/
Primary Examiner
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